"We view Headwaters Inc. v. Talent Irrigation District 243 F.3d 526 (9th Cir. 2001) as binding on the U. S . Army Corps of Engineers, Northwestern Division, in the geographic jurisdiction of the U.S. Court of Appeals for the Ninth Circuit. In that case, the court held that irrigation canals that receive water from natural streams and lakes, and divert water to streams and creeks, are connected as "tributaries" to those other waters. The Ninth Circuit further held that a "stream which contributes its flow to a larger stream or other body of water is a tributary. . . . As tributaries, the canals are 'waters of the United States,' and are subject to the CWA and its permit requirement. " Headwaters 243 F.3d at 533. Moreover, the court held that, "Even tributaries that flow intermittently are 'waters of the United States." Id. at 534. Corps of Engineers regulations at 33 C.F.R. § 328.3(a)(5) assert CWA jurisdiction over all tributaries to other jurisdictional waters of the United States. J factual situations where the Headwaters precedent applies, it would supercede any contrary conclusion that might be drawn from previous Corps of Engineers policy statements regarding ditches."

Riparian Wetland Design: Challenges and Solutions

Kurt D. Wald
and
Dale E. Anderson

Case Studies of two Projects

- Cow Creek Wetland and Stream Mitigation- Idaho Transportation Department
- Bear Creek Enhancement- City of Redmond Washington

Cow Creek near Genesee, Idaho east of the US 95 alignment.

Cow Creek was last dredged in 1972 to control large discharges

Cow Creek Wetland mitigation and Stream restoration

- ITD District 2
- Satisfies mitigation for three projects
- The existing creek is significantly altered
- Enhance and create 13.5 acres
  - 2.02 acres of palustrine emergent (PEM) wetland
  - 3.98 acres of palustrine scrub/shrub (PSS) wetland
  - 7.51 acres of palustrine forested (PFO) wetland

Cow Creek is deeply entrenched in the Latah formation in a gentle gradient valley.

Design Challenges of Cow Creek

- Hydrology
  - Will groundwater be available to wetlands?
  - How to managed discharge fluctuations in the design?
- How to develop plans and specifications for a “non roadway project”?

Hydrology Groundwater

- Installing Piezometers
  - ITD collected 1 year of static water levels
  - Groundwater is present year-round and fluctuates several feet
- Design Solution:
  - Cow Creek will be widened significantly and the bank slopes reduced
  - Install well and irrigation system

Cow Creek is recharged by groundwater for at least a portion of the year.

Hydrology Design Challenges- Surface Water

- Bi-modal system forcing the design of a riparian zone that can handle the discharges, protect the plant community from high discharges and still provide water at rooting depths

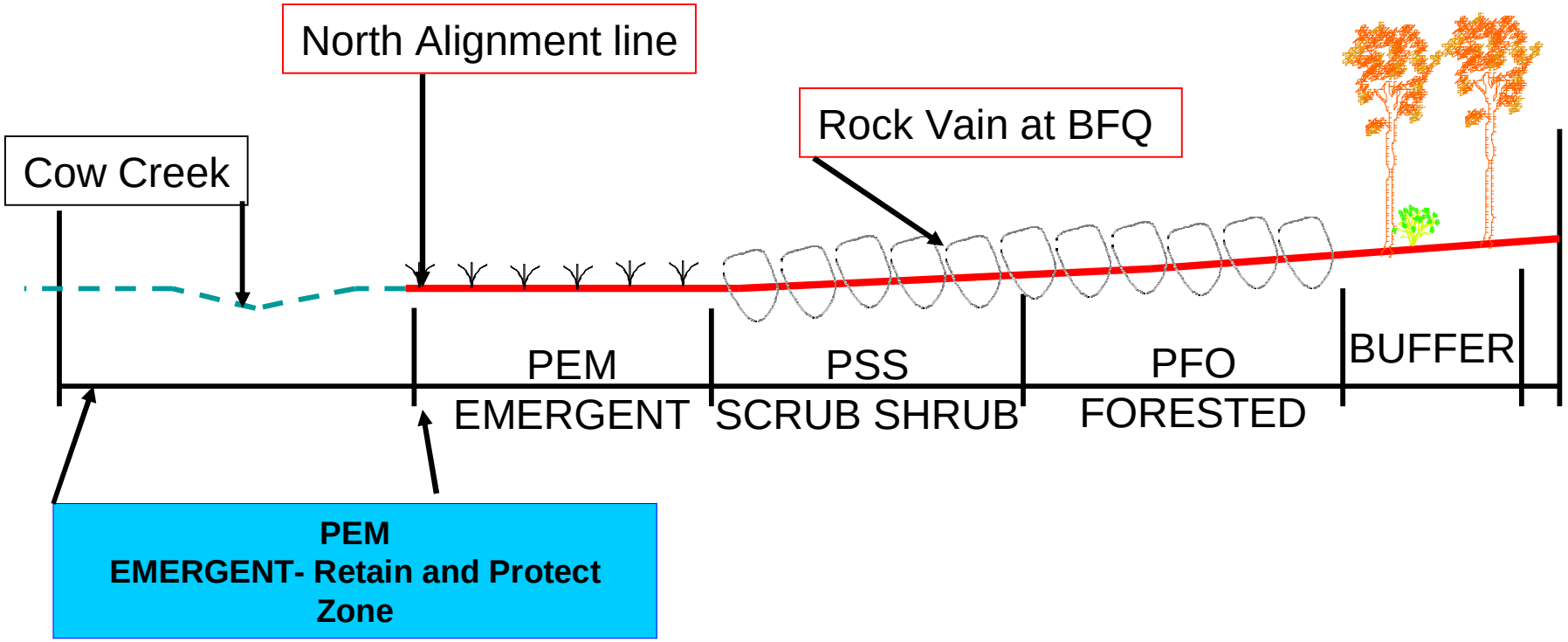
- Model small base flows and the larger “Flashy” flows
  - Base Flows 10 to 20 cfs
  - 2 and 3 year bank full discharges
    - Approximately 300 cfs
  - USGS has recorded discharges of 900-1000 cfs above the project area

Approximately 18 cfs and almost bank full in the low flow channel

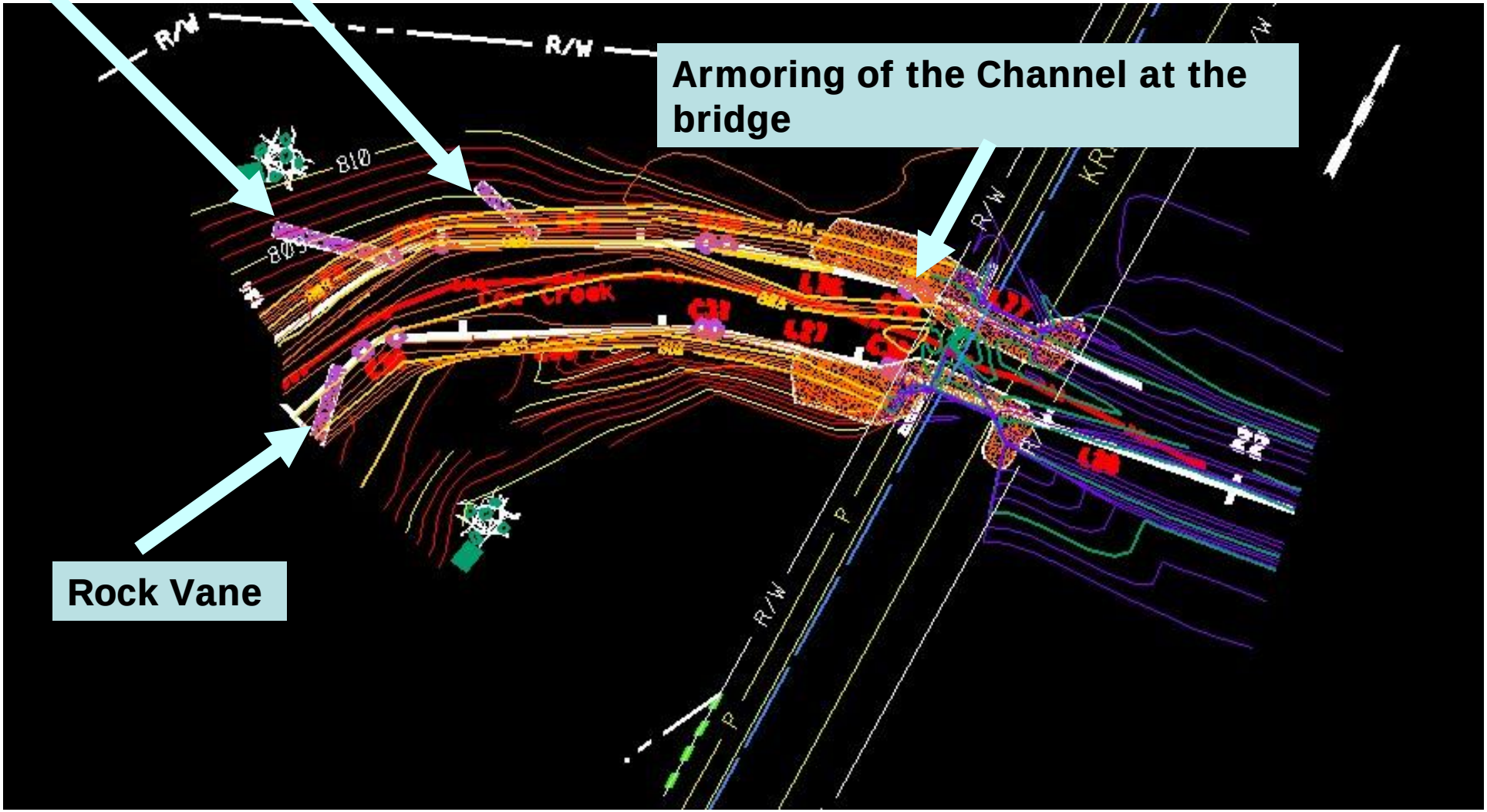
Debris at nearly Bankfull in larger Channel

Hydrology Design Solutions- Surface Water

- Install rock vanes at bankfull heights
- Rock vanes will:
  - Direct flow to the center of the channel in the existing emergent footprint
  - Reduce velocities at the banks
  - Still provide some sedimentation in floodplain

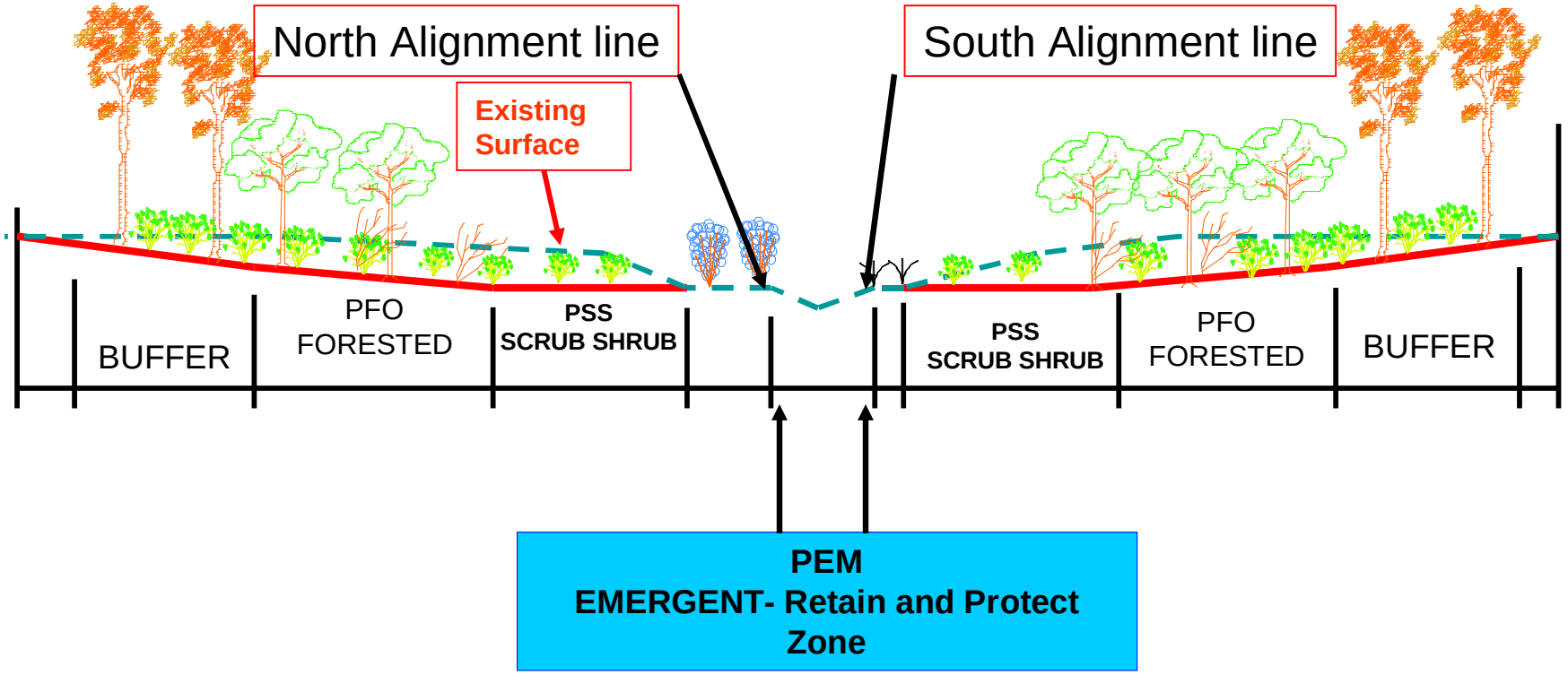


Rock Vanes at 20-30 Degrees in to the Flow Direction



Developing the control alignments

- No disturbance in the PEM, Hybrid PEM or channel
- Requires two alignments one North bank one South Bank
- Grading slope matched to stream velocities and width of planting zones
  - PSS Scrub Shrub
  - Forested PFO
  - Buffer



Challenge: Making the plans match the design

- North and South alignment tables in plans
- North and South Grading tables with highly variable widths
- Profile of mitigation design must match existing
- Develop new habitat feature pay bubbles that can be understood by contractors: Bird Box, Brush Piles, etc.
- Habitat features are called out as approximate location and orientations
  - Actual placement base on field consultation
  - Appearance is intended to be natural and informal

Challenge: Developing a natural habitat feel to the mitigation site requires

- Non uniform placement of habitat features
- Adequate spacing and variation of placement
- Creating habitat diversity with vegetation types...and of course

- On site wetlands experts during construction

Bear Creek Enhancement

A Natural Alliance

Bear Creek Enhancement - Overview and Concept Development

- Stream Enhancement Project - Redmond Washington
- Primary Objective - Fish Habitat Enhancement
- Other Benefits
  - Stream Relocation Allows Space - Phase 3 construction of the SR 520/SR 202
  - Provides Pedestrian / Bike Trail - Amenity for City of Redmond & Redmond Towne Center

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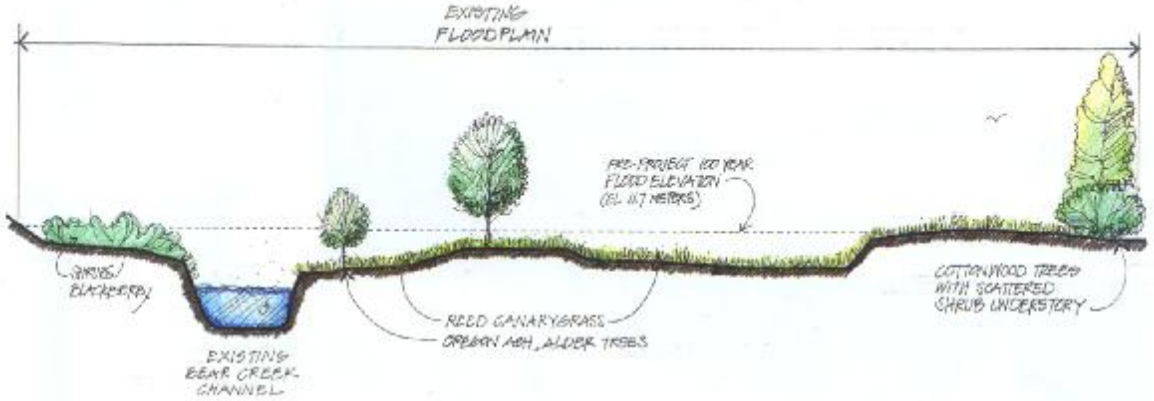
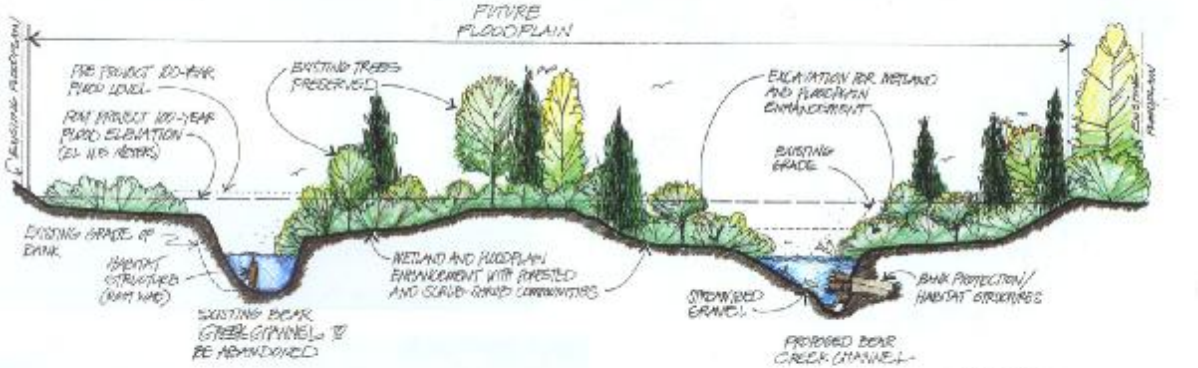
Project Features

- Stream Relocation - New Channel Construction
- Floodplain Excavation
- Creation of Stream Side Channel
- Wetland Enhancement / Creation
- Floodplain / Riparian Corridor Revegetation
- Cost - $3 million



EXISTING CONDITION



PROPOSED CONDITION

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SR 202/SR 520 BEAR CREEK ENHANCEMENT
Section A - A

IDAHO TRANSPORTATION DEPARTMENT

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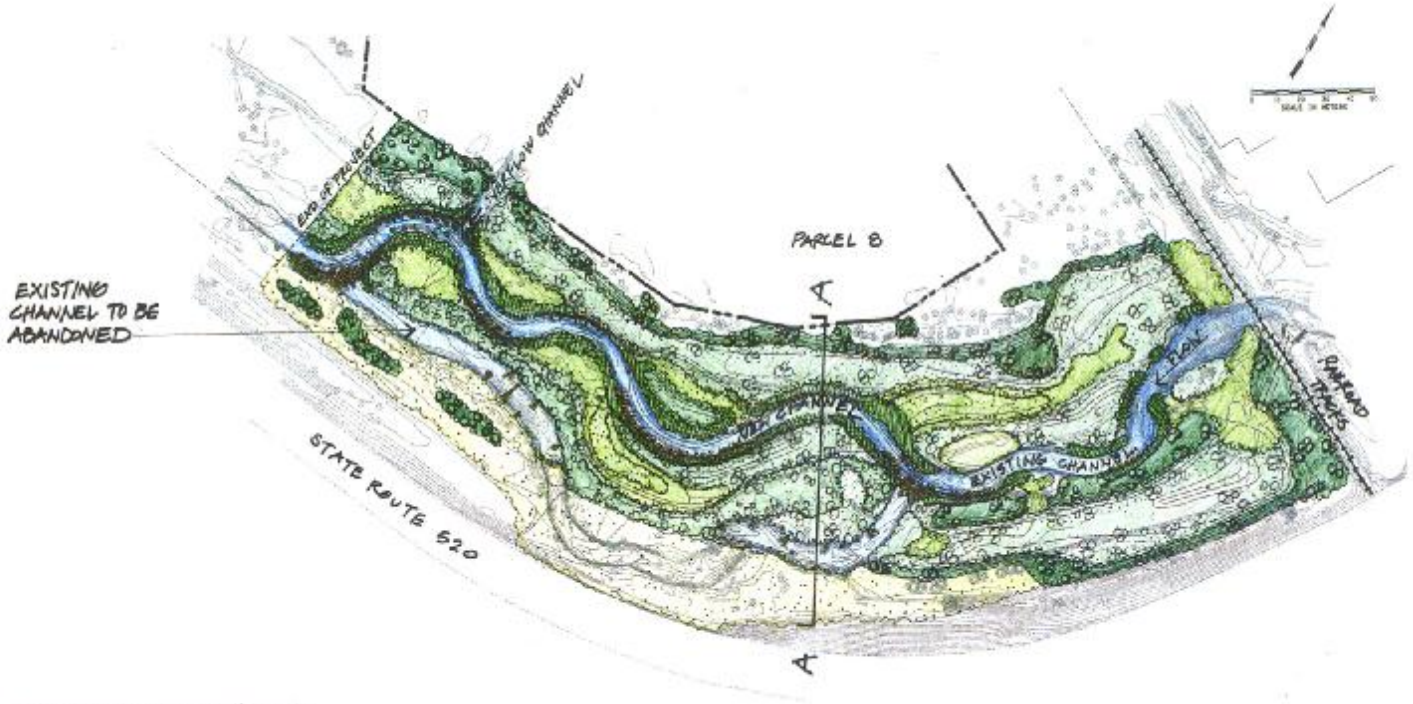

TREE REMOVAL AND PLANTING SUMMARY

TOTAL NUMBER OF TREES ON SITE	964
TOTAL NUMBER OF DECIDUOUS TREES REMOVED	46
REQUIRED NUMBER OF DECIDUOUS REPLACEMENT TREES	149
APPROX. NUMBER OF DECIDUOUS TREES PLANTED	998
TOTAL NUMBER OF EVERGREEN TREES REMOVED	0
REQUIRED NUMBER OF EVERGREEN REPLACEMENT TREES	0
APPROX. NUMBER OF EVERGREEN TREES PLANTED	1884

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LEGEND

- UPLAND FOREST
- FORESTED WETLAND
- SCRUB-SHRUB/EMERGENT WETLAND
- BANK PROTECTION AND STREAMBANK PLANTING
- UPLAND GRASS SEEDING
- SCRUB-SHRUB WETLAND

SR 202/SR 520 BEAR CREEK ENHANCEMENT

Proposed Conditions

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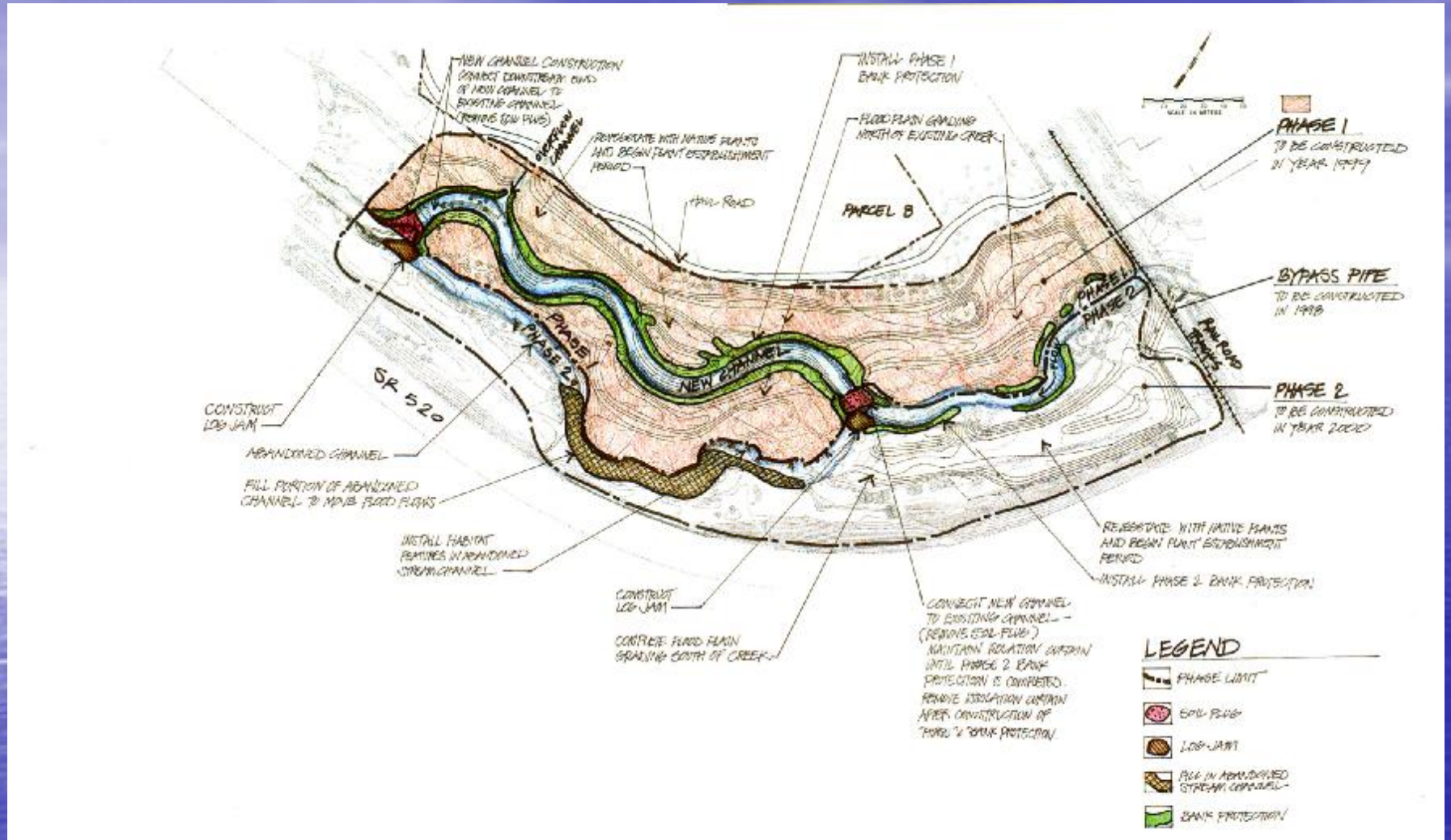

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Concept Planning

- Constraints
  - Multiple floodplain owners
  - Significant floodplain constraints
    - Adjacent urban land uses - Highway & Commercial Expansion
    - Zero-rise flood way
- Response
  - Established design objectives early

Concept Planning

- Design Objectives
  - Determine extent of stream channel relocation
  - Design a natural looking but stable channel
  - Maintain function of streamside corridor
  - Maximize fish habitat
  - Comply with flood regulations
  - Plan for compatibility with adjacent COE project

WSDOT Project Management Critical Success Factors

- Actively keep WSDOT decision-makers endorsement in place
  - Program Management
  - Project Development/Area Managers
  - Attorney Generals Office
  - Environmental Services
  - Construction Office

New Stream Channel Design

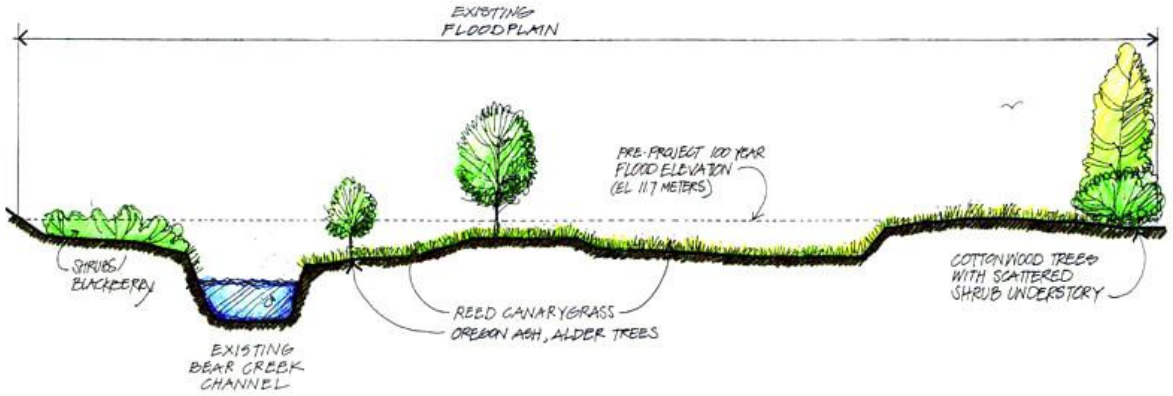
- 3- Levels - Streambank Design
- Logs and anchoring
- Coir wraps with soil and plants
- Stream gravel and pool rock

Planting Design Objectives

- Wildlife habitat
- Flood attenuation, water quality improvement
- Establish self-sustaining wetland and upland buffer community
- Erosion control
- Minimize invasive plant species dominance
- Bioengineering in conjunction with bank protection

Planting Success Factors

- Utilize multidisciplinary team during construction process
  - NW Region construction coordination matrix
  - Construction Engineer/Landscape Architect/Engineer/ Permit Coordinator/Biologist
  - Timely reviews by Landscape Architect during construction and plant establishment period
- Construction issues



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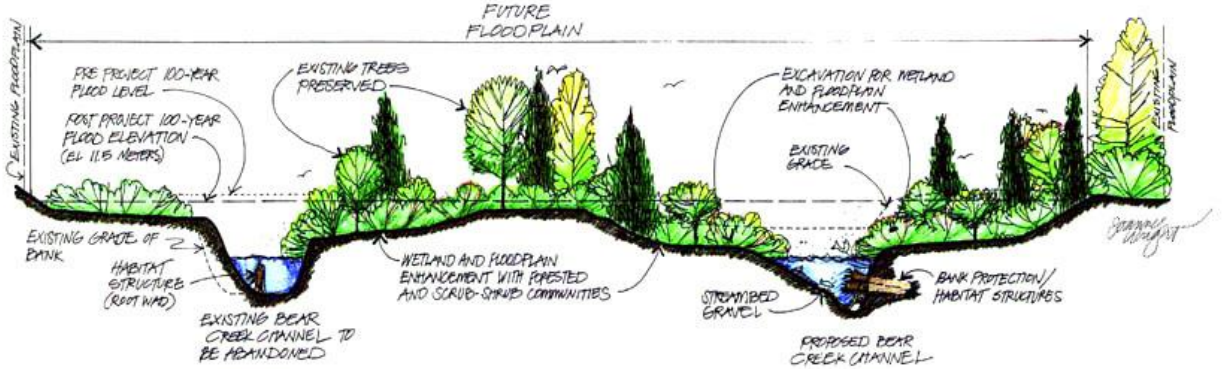

PROPOSED CONDITION

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SR 202/SR 520 BEAR CREEK ENHANCEMENT
Section A - A

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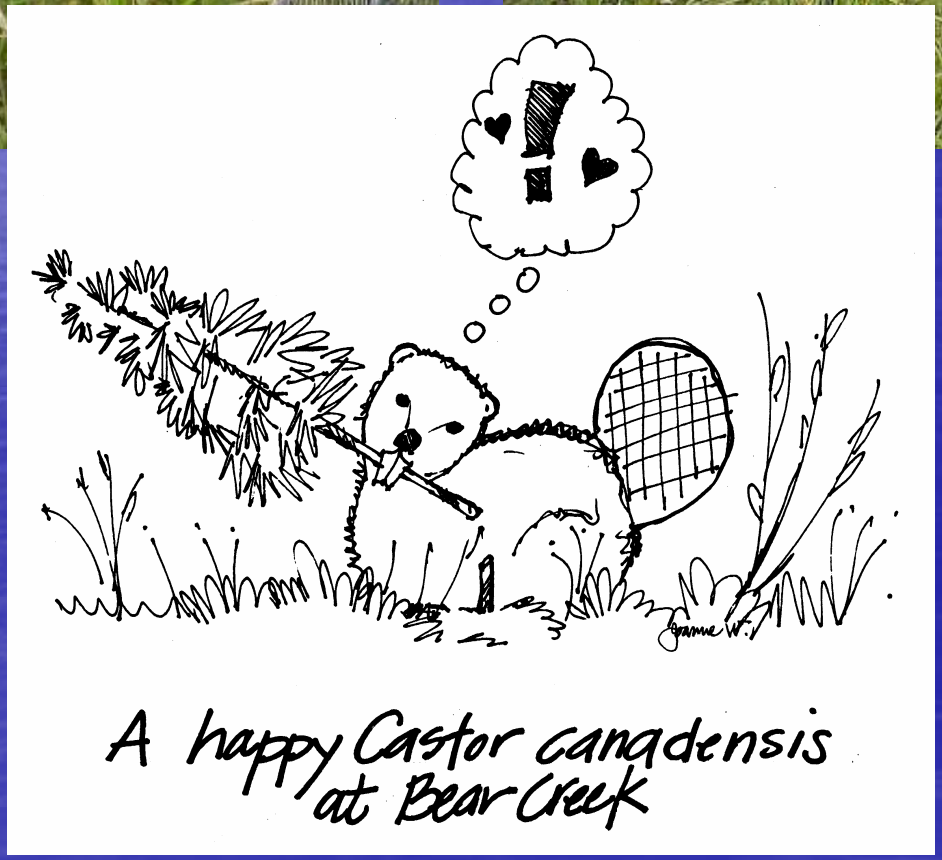

Keys to Construction Success

The Sheetpile separates the old stream channel from the new stream channel.

How do you regulate the flow into the new stream channel once the sheetpile is removed...

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The combination of an Aqua-sock, pipe and sandbags are used to regulate the flow of water into the new stream channel.

The Aqua-sock is also used to keep water out of the work area for construction of habitat structures.

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ADEKA Ultra Seal A-50
a waterstop for sheetpile
keeps the work area
water free.

Thus allowing the habitat
structures to be constructed.

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The completed log jam structure.

Sockeye Salmon spawn in the enhanced stream.

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Bear Creek Enhancement State and National Awards

- Awards
  - Selected by CECW as a Year 2000 Honor Award
  - Selected by ACEC for a National Recognition Award for environmental engineering

Thank You...

Questions?